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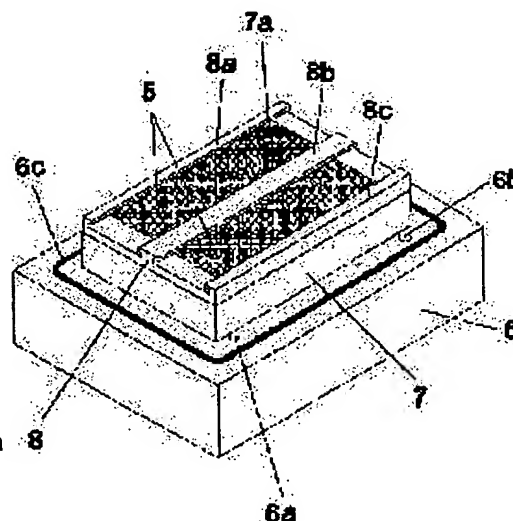
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(54) VACUUM TREATMENT APPARATUS AND SUBSTRATE FEED METHOD THEREIN

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a vacuum treatment apparatus capable of preventing the feed mistake of a substrate, and a substrate feed method in the vacuum treatment apparatus.

SOLUTION: In the substrate feed method in the vacuum treatment apparatus for performing the feed of the substrate 5 in and out of the placing part 7a in a vacuum chamber 2a, the substrate 5 is held in a horizontal posture in a feed-in guide part 10 at the time of feed-in operation to be allowed to stand by and the feed-in guide part 10 is allowed to approach the placing part 7a by a cylinder 15 when the vacuum chamber 2a is in an open state to be connected to a substrate guide part 8, and the substrate 5 on the feed-in guide part 10 is moved on the placing part 7a by a feed-in arm 13. At the time of feed-out operation, a feed-out guide part 11 is allowed to approach the placing part 7a by a cylinder 18 to be connected to the substrate guide part 8 and the substrate 5 on the placing part 7a is fed out to the feed-out guide part 11 by a feed-out arm 14. By this constitution, the discontinuous part of the guide part is not generated at the time of feed of the substrate 5 and the feed in and out of the substrate 5 can be certainly performed.



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CLAIMS

[Claim(s)]

[Claim 1] The processing room which performs vacuum processing of the substrate of a processing object is formed. The vacuum chamber which can be opened and closed up and down, The installation section which has the substrate guide section for guiding conveyance of a substrate while being arranged in said processing interior of a room and laying said substrate, The carrying-in guide section which guides a substrate at the time of carrying-in actuation of the substrate to the installation section while holding the substrate carried in to said installation section by the horizontal position, The taking-out guide section which holds the substrate taken out while guiding the substrate at the time of taking-out actuation of the substrate from the installation section by the horizontal position, A guide migration means to make said carrying-in guide section and the taking-out guide section approach to the installation section, respectively, and to connect when said vacuum chamber is in an open condition, The vacuum processor characterized by having a substrate carrying-in migration means to move the substrate on said carrying-in guide section on the installation section, and a substrate taking-out migration means to move the substrate on the installation section on said taking-out guide section.

[Claim 2] It is the substrate conveyance approach in the vacuum processor which carries in the substrate of a processing object to the processing room which is formed in the vacuum chamber which can be opened and closed up and down, and performs vacuum processing, and is taken out from a processing room. The carrying-in actuation which carries in a substrate to the installation section in which it is arranged in said processing room and said substrate is laid The standby process which makes the substrate carried in to said installation section hold by the horizontal position in the carrying-in guide section, and makes it stand by in it, The carrying-in guide connection process which said carrying-in guide section is made to approach to the installation section, and is made to connect with the substrate guide of this installation section when said vacuum chamber is in an open condition, The carrying-in migration process of moving the substrate on the carrying-in guide section on the installation section with a substrate carrying-in migration means in a carrying-in guide connection condition is included. The taking-out actuation which takes out a substrate from the installation section of said processing interior of a room The taking-out guide connection process which the taking-out guide section is made to approach to the installation section, and is made to connect with said substrate guide section when said vacuum chamber is in an open condition, The substrate conveyance approach in the vacuum processor characterized by including the taking-out migration process of moving the substrate on the installation section on the taking-out guide section with a substrate taking-out migration means in a taking-out guide connection condition.

[Claim 3] The substrate conveyance approach in the vacuum processor according to claim 2 characterized by performing a carrying-in migration process and a taking-out migration process to coincidence when having connected said carrying-in guide section and the taking-out guide section with the substrate guide section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the substrate conveyance approach in the vacuum processor and vacuum processor which perform vacuum processing of plasma treatment etc. for a substrate.

[0002]

[Description of the Prior Art] Plasma treatment equipment is known as equipment which performs surface treatment of a substrate. This plasma treatment equipment generates the plasma in the processing interior of a room of a reduced pressure ambient atmosphere, and performs plasma treatment of the substrate which is an object. The method of conveying a substrate by the horizontal position as an approach of carrying in a substrate to the processing interior of a room, in the road [conveyance] it was generally prepared in the plane is used. This approach lays a substrate in in the road [conveyance] the side-face guide was prepared corresponding to the width method of a substrate, and performs carrying in in the processing room of a substrate, and taking out from a processing room by the approach of **** (ing) the back end section of a substrate etc.

[0003]

[Problem(s) to be Solved by the Invention] By the way, since it is necessary to make the interior of a processing room into the sealing structure intercepted from the outside, in the part in which the side attachment wall which intercepts the inside and outside of a processing room descends to the above-mentioned conveyance on the street, a conveyance way breaks off by the clearance equivalent to the thickness of the side attachment wall of a processing room, and serves as discontinuity. Therefore, in case a substrate passes this discontinuous part, a substrate moves in the condition that neither the vertical direction nor a longitudinal direction is guided. When the candidate for conveyance is the substrate which is easy to produce camber, such as a thin substrate, and bending at this time, the point of a substrate is caught in discontinuity in this clearance part, and they are a lifting and a cone about a conveyance mistake. And breakage of a substrate was produced by this conveyance mistake, and plasma treatment in the processing interior of a room was performed with the location gap condition, and it had become the cause of the fault of inducing abnormality discharge.

[0004] Then, this invention aims at offering the substrate conveyance approach in the vacuum processor and vacuum processor which can prevent the conveyance mistake of a substrate.

[0005]

[Means for Solving the Problem] A vacuum processor according to claim 1 forms the processing room which performs vacuum processing of the substrate of a processing object. The vacuum chamber which can be opened and closed up and down, The installation section which has the substrate guide section for guiding conveyance of a substrate while being arranged in said processing interior of a room and laying said substrate, The carrying-in guide section which guides a substrate at the time of carrying-in actuation of the substrate to the installation section while holding the substrate carried in to said installation section by the horizontal position, The taking-out guide section which holds the substrate

taken out while guiding the substrate at the time of taking-out actuation of the substrate from the installation section by the horizontal position, A guide migration means to make said carrying-in guide section and the taking-out guide section approach to the installation section, respectively, and to connect when said vacuum chamber is in an open condition, It had a substrate carrying-in migration means to move the substrate on said carrying-in guide section on the installation section, and a substrate taking-out migration means to move the substrate on the installation section on said taking-out guide section. [0006] The substrate conveyance approach in a vacuum processor according to claim 2 It is the substrate conveyance approach in the vacuum processor which carries in the substrate of a processing object to the processing room which is formed in the vacuum chamber which can be opened and closed up and down, and performs vacuum processing, and is taken out from a processing room. The carrying-in actuation which carries in a substrate to the installation section in which it is arranged in said processing room and said substrate is laid The standby process which makes the substrate carried in to said installation section hold by the horizontal position in the carrying-in guide section, and makes it stand by in it, The carrying-in guide connection process which said carrying-in guide section is made to approach to the installation section, and is made to connect with the substrate guide of this installation section when said vacuum chamber is in an open condition, The carrying-in migration process of moving the substrate on the carrying-in guide section on the installation section with a substrate carrying-in migration means in a carrying-in guide connection condition is included. The taking-out actuation which takes out a substrate from the installation section of said processing interior of a room When said vacuum chamber is in an open condition, the taking-out guide connection process which the taking-out guide section is made to approach to the installation section, and is made to connect with said substrate guide section, and the taking-out migration process of moving the substrate on the installation section on the taking-out guide section with a substrate taking-out migration means in a taking-out guide connection condition are contained.

[0007] The substrate conveyance approach in a vacuum processor according to claim 3 is the substrate conveyance approach in a vacuum processor according to claim 2, and when having connected said carrying-in guide section and the taking-out guide section with the substrate guide section, it performs a carrying-in migration process and a taking-out migration process to coincidence.

[0008] According to this invention, it has the guide migration means to which horizontal migration of the carrying-in guide section which guides a substrate at the time of carrying-in actuation of the substrate to the processing interior of a room, and the taking-out guide section which guides a substrate at the time of taking-out actuation of the substrate from a processing room is carried out. By making the carrying-in guide section and the taking-out guide section approach to the installation section, respectively, when a vacuum chamber is in an open condition, and connecting with the substrate guide section to which it shows a substrate at the time of conveyance actuation of the substrate on the installation section The discontinuous part of the guide section does not occur at the time of substrate conveyance, but carrying in and taking out of the substrate to a processing room can be ensured.

[0009]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing. The perspective view of the installation section of the vacuum processor of the gestalt of 1 operation of this invention, drawing 3 , and drawing 4 are the explanatory views of the substrate conveyance approach [in / the partial perspective view of the vacuum processor of the gestalt of 1 operation of this invention, drawing 5 , and drawing 6 drawing 1 and / in drawing 2 / the vacuum processor of the gestalt of 1 operation of this invention] of operation. [the perspective view of the vacuum processor of the gestalt of 1 operation of this invention]

[0010] First, the whole vacuum processor structure is explained with reference to drawing 1 . In drawing 1 , a vacuum processor consists of a substrate feed zone 1, the vacuum processing section 2, and a substrate stripping section 3. When the vacuum processing section 2 consists of the base section 6 and covering device material 9 and the covering device material 9 goes up and down, it has vacuum chamber 2a which can be opened and closed up and down, and it is in the condition to which the covering device material 9 contacted the top face of the base section 6, and vacuum chamber 2a forms processing room

9a by which it was sealed for performing vacuum processing of the substrate of a processing object (refer to drawing 5 (a)).

[0011] As shown in drawing 2, in the above-mentioned processing room 9a on the base section 6, the polar zone 7 is projected and formed in the upper part from the top face of the base section 6, and the top face of the polar zone 7 has become installation section 7a which lays the substrate 5 of a processing object. Installation section 7a has the substrate guide section 8 for guiding conveyance of a substrate 5 while laying a substrate 5. The guide rails 8a, 8b, and 8c of three articles which guide the side face of a substrate 5 are formed in the top face of the substrate guide section 8 at the time of substrate conveyance, and two substrates 5 can be laid and conveyed now at coincidence.

[0012] The top face of the base section 6 where the covering device material 9 descends and the side-attachment-wall section contacts is equipped with seal member 6c, and the covering device material 9 and base section 6 top face are sealed at the time of contact. Moreover, gas supply hole 6a, and evacuation and atmospheric-air installation hole 6b are prepared in the top face of the base section 6.

[0013] In drawing 1, the substrate feed zone 1 is equipped with the magazine 4 which contains many substrates 5 of a vacuum processing object in the state of tiering, and the carrying-in guide section 10 is arranged between a magazine 4 and the vacuum processing section 2. The carrying-in guide section 10 guides a substrate 5 at the time of carrying-in actuation of the substrate 5 to installation section 7a while holding the substrate 5 which is extruded from a magazine 4 and carried in to installation section 7a by the horizontal position. The substrate 5 on the carrying-in guide section 10 changes to the substrate guide section 8 on the polar zone 7 further, and is carried in to installation section 7a. Migration of the substrate 5 at the time of this substrate carrying-in actuation is performed by ****(ing) a substrate 5 by the carrying-in arm 13.

[0014] The substrate stripping section 3 is equipped with the same magazine 4 as the substrate feed zone 1, and the taking-out guide section 11 is arranged between the vacuum processing section 2 and the substrate stripping section 3. The taking-out guide section 11 holds the substrate 5 taken out while guiding the substrate 5 at the time of taking-out actuation of the substrate 5 from installation section 7a by the horizontal position. The substrate 5 by which vacuum processing was carried out in the vacuum processing section 2 changes on the taking-out guide section 11 from the substrate guide section 8, further, is pushed in in a magazine 4 and collected from on the taking-out guide section 11. Migration of the substrate 5 at the time of this substrate taking-out actuation is performed by ****(ing) a substrate 5 by the conveyance arm 14.

[0015] Next, with reference to drawing 3 and drawing 4, the detail of the substrate conveyance device in which carry in a substrate 5 to installation section 7a on the polar zone 7, and it is taken out is explained. In drawing 3, the carrying-in guide section 10 and the taking-out guide section 11 are held by the arm members 16 and 17, respectively. The arm members 16 and 17 are combined with the rods 15a and 18a of cylinders 15 and 18, respectively, and the carrying-in guide section 10 and the taking-out guide section 11 can be reciprocated level in the direction of X by cylinders 15 and 18, respectively.

[0016] Moreover, the carrying-in guide section 10 and the taking-out guide section 11 are equipped with the guide rails 10a, 10b, and 10c and guide rails 11a, 11b, and 11c of the same array as the guide rails 8a, 8b, and 8c of the substrate guide section 8, respectively. The relative position to the substrate guide section 8 of the carrying-in guide section 10 and the taking-out guide section 11 here So that it may be located on the straight line same about the direction of Y as the guide rails 8a, 8b, and 8c with which guide rails 10a, 10b, and 10c and guide rails 11a, 11b, and 11c correspond, respectively Moreover, about the Z direction, it is arranged so that the conveyance side of the carrying-in guide section 10 and the taking-out guide section 11 may serve as the same height as the conveyance side of the substrate guide section 8.

[0017] Therefore, so that a cylinder 15 may be driven as shown in drawing 4, and edge 10e of the downstream of the carrying-in guide section 10 may approach installation section 7a Namely, by carrying out horizontal migration of the <TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300> carrying-in guide section 10 so that edge 10e may approach 8d of edges of the upstream of the substrate guide section 8 The carrying-in guide section 10 connects with the substrate guide section 8.

[0018] Moreover, the taking-out guide section 11 connects with the substrate guide section 8 by carrying out horizontal migration of the taking-out guide section 11 so that 11d of edges may approach edge 8e of the downstream of the substrate guide section 8 so that a cylinder 18 may be driven and 11d of edges of the upstream of the taking-out guide section 11 may approach installation section 7a similarly. Cylinders 15 and 18 serve as a guide migration means to make the carrying-in guide section 10 and the taking-out guide section 11 approach to installation section 7a, respectively, and to connect, when vacuum chamber 2a is in an open condition.

[0019] This connection serves as a gestalt which connects installation section 7a the one side (downstream) of the carrying-in guide section 10, and connects installation section 7a with coincidence the other side (upstream) of the taking-out guide section 11. As shown in drawing 3 R> 3, in the gestalt of the above-mentioned implementation, edge 10e of the downstream of the carrying-in guide section 10 in addition, at the 8d of edges of the upstream of the substrate guide section 8 Moreover, although 11d of edges of the upstream of the taking-out guide section 11 shows the example made to approach to the location which almost contacts edge 8e of the downstream of the substrate guide section 8, respectively, you may make it establish a clearance in each connected surface in an approach condition in the range of a substrate 5 which does not have offense in changing.

[0020] And in this connection condition, carrying in of the substrate 5 from the carrying-in guide section 10 to installation section 7a and taking out of the substrate 5 from installation section 7a to the taking-out guide section 11 are performed. The carrying-in arm 13 and the taking-out arm 14 are formed in the trolley table 12 arranged in the direction of X, and the carrying-in arm 13 makes a successive range the carrying-in guide section 10 and the substrate guide section 8, and the taking-out arm 14 makes a successive range the substrate guide section 8 and the taking-out guide section 11, and it moves in the direction of X, respectively. Moreover, the carrying-in arm 13 and the taking-out arm 14 can move up and down according to the vertical-movement device which is not illustrated.

[0021] By having the conveyance pawls 13a and 14a, respectively, and driving a trolley table 12 in the condition of having made the conveyance pawls 13a and 14a contacting the back end section of a substrate 5, the carrying-in arm 13 and the taking-out arm 14 pass through the carrying-in arm 13 and the taking-out arm 14 substrate guide section 8 from the carrying-in guide section 10, respectively, and move a substrate 5 to the taking-out guide section 11 from the substrate guide section 8. Therefore, the trolley table 12 and the carrying-in arm 13 serve as a substrate carrying-in migration means to move the substrate 5 on the carrying-in guide section 10 on installation section 7a, and the trolley table 12 and the taking-out arm 14 serve as a substrate taking-out migration means to move the substrate 5 on installation section 7a on the taking-out guide section 11.

[0022] The substrate conveyance device of this vacuum processor has the above composition, and the substrate conveyance actuation in a vacuum processor is explained with reference to drawing 5 and drawing 6 below. Drawing 5 and drawing 6 show a series of actuation until it takes out this substrate 5 and carries in the new substrate 5 to installation section 7a in processing room 9a, after vacuum processing within processing room 9a is completed for one substrate 5.

[0023] In drawing 5 (a), the covering device material 9 of vacuum chamber 2a is in the condition of having descended on the base section 6, and vacuum processing for the substrate 5 laid in the substrate guide section 8 on the polar zone 7 is performed within processing room 9a formed in this condition. At this time, in the carrying-in guide section 10, the following substrate 5 is held by the horizontal position, it is in a standby condition, and the taking-out guide section 11 is already in the empty condition. And conveyance pawl 13a of the carrying-in arm 13 and conveyance pawl 14a of the taking-out arm 14 are in a position in readiness, respectively.

[0024] If vacuum processing within processing room 9a is completed, as shown in drawing 5 (b), the covering device material 9 goes up and vacuum chamber 2a will be in an open condition. And conveyance pawl 14a moves to the upstream of the substrate guide section 8 after this. Subsequently, as shown in drawing 5 (c), the carrying-in guide section 10 and the taking-out guide section 11 are made to approach to the substrate guide section 8, respectively, and it connects.

[0025] And you drop the conveyance pawls 13a and 14a, and make it located in the back end section of

each of the substrate 5 on the carrying-in guide section 10, and the substrate 5 on the substrate guide section 8 in this condition. Subsequently, while the substrate 5 after vacuum processing is taken out on the taking-out guide section 11 from installation section 7a by moving the conveyance pawls 13a and 14a to the downstream as shown in drawing 5 (d), the new substrate 5 is carried in to installation section 7a from on the carrying-in guide section 10. At the time of this substrate conveyance actuation, since seal member 6c on the base section 6 will be in the condition of having covered the upper part by the carrying-in guide section 10 and the taking-out guide section 11, it can protect seal member 6c from the consumption by contact of a foreign matter etc.

[0026] Then, while making the carrying-in guide section 10 and the taking-out guide section 11 isolate from installation section 7a so that the conveyance pawls 13a and 14a may be raised and it may be shown subsequently to drawing 6 (b) as shown in drawing 6 (a), the conveyance pawls 13a and 14a are made to leave to each position in readiness. It will be in the condition which can start 1 cycle of new vacuum processing by this.

[0027] Within processing room 9a which the covering device material 9 was dropped on the base section 6, and was formed, as shown in drawing 6 (c) after this, while vacuum processing is performed for the new substrate 5, the following substrate 5 is extruded and supplied from a magazine 4 at the carrying-in guide section 10, and it will be in a standby condition in the carrying-in guide section 10. Moreover, the substrate [finishing / processing] 5 taken out by the taking-out guide section 11 is pushed in by conveyance pawl 14a in the magazine 4 of the downstream, and are collected.

[0028] As explanation was given [above-mentioned], in the above-mentioned substrate conveyance approach, the carrying-in actuation which carries in a substrate 5 to installation section 7 of processing room 9a a The standby process which makes the substrate 5 carried in to installation section 7a hold by the horizontal position in the carrying-in guide section 10, and makes it stand by in it, The carrying-in guide connection process which the carrying-in guide section 10 is made to approach to installation section 7a, and is made to connect with the substrate guide section 8 of this installation section 7a when vacuum chamber 2a is in an open condition, It is a thing including the carrying-in migration process of moving the substrate 5 on the carrying-in guide section 10 on installation section 7a by the carrying-in arm 13 in a carrying-in guide connection condition.

[0029] Moreover, the taking-out actuation which takes out the substrate [finishing / processing] 5 from installation section 7a The taking-out guide connection process which the taking-out guide section 11 is made to approach to installation section 7a, and is made to connect with the substrate guide section 8 when vacuum chamber 2a is in an open condition, The taking-out migration process of moving the substrate 5 on installation section 7a on the taking-out guide section 11 by the taking-out arm 14 in a taking-out guide connection condition is included. And in the above-mentioned substrate conveyance actuation, when having connected the carrying-in guide section 10 and the taking-out guide section 11 with the substrate guide section 8, it is the gestalt which performs a carrying-in migration process and a taking-out migration process to coincidence.

[0030] When aimed at the substrate which the discontinuous part of the guide section to which it shows a substrate by adopting such a substrate conveyance approach at the time of substrate conveyance does not generate, but a conveyance mistake tends to generate that it is easy to produce the curvature and bending like a thin substrate, even if it is, carrying in and taking out of the substrate to a processing room can be carried out certainly.

[0031]

[Effect of the Invention] According to this invention, it has the guide migration means to which horizontal migration of the carrying-in guide section which guides a substrate at the time of carrying-in actuation of the substrate to the processing interior of a room, and the taking-out guide section which guides a substrate at the time of taking-out actuation of the substrate from a processing room is carried out. Since the carrying-in guide section and the taking-out guide section are made to approach to the installation section, respectively and it was made to connect with the substrate guide section to which it shows a substrate at the time of conveyance actuation of the substrate on the installation section when a vacuum chamber was in an open condition The discontinuous part of the guide section does not occur at

the time of substrate conveyance, but when aimed at a thin substrate, even if it is, carrying in and taking out of the substrate to a processing room can be ensured.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The perspective view of the vacuum processor of the gestalt of 1 operation of this invention

[Drawing 2] The perspective view of the installation section of the vacuum processor of the gestalt of 1 operation of this invention

[Drawing 3] The partial perspective view of the vacuum processor of the gestalt of 1 operation of this invention

[Drawing 4] The partial perspective view of the vacuum processor of the gestalt of 1 operation of this invention

[Drawing 5] The explanatory view of the substrate conveyance approach in the vacuum processor of the gestalt of 1 operation of this invention of operation

[Drawing 6] The explanatory view of the substrate conveyance approach in the vacuum processor of the gestalt of 1 operation of this invention of operation

[Description of Notations]

- 1 Substrate Feed Zone
- 2 Vacuum Processing Section
- 2a Vacuum chamber
- 3 Substrate Stripping Section
- 5 Substrate
- 7 Polar Zone
- 7a Installation section
- 8 Substrate Guide Section
- 10 Carrying-in Guide Section
- 11 Taking-Out Guide Section
- 12 Trolley Table
- 13 Carrying-in Arm
- 14 Taking-Out Arm
- 15 18 Cylinder

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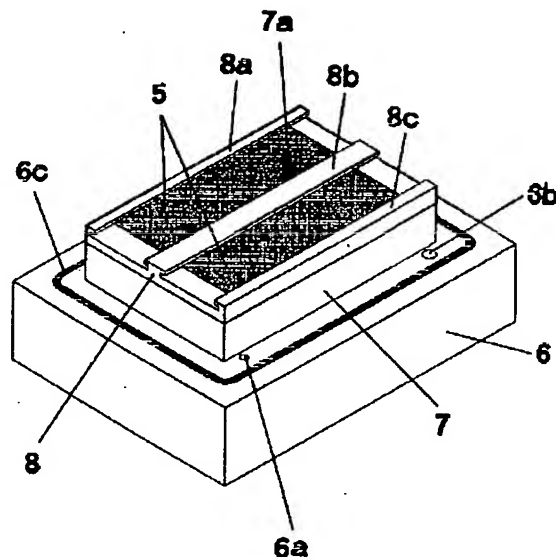
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(54) 【発明の名称】 真空処理装置及び真空処理装置における基板搬送方法

(57) 【要約】

【課題】 基板の搬送ミスを防止することができる真空処理装置及び真空処理装置における基板搬送方法を提供することを目的とする。

【解決手段】 真空チャンバ2 a内の載置部7 aに基板5を搬入・搬出する真空処理装置における基板搬送方法において、搬入動作時には、基板5を搬入ガイド部10に水平姿勢で保持させて待機させ、真空チャンバ2 aが開状態のときに搬入ガイド部10をシリンダ15によって載置部7 aに接近させて基板ガイド部8と連結させ、搬入アーム13によって搬入ガイド部10上の基板5を載置部7 a上に移動させる。搬出動作時には、搬出ガイド部11をシリンダ18によって載置部7 aに接近させて基板ガイド部8と連結させ、搬出アーム14によって載置部7 a上の基板5を搬出ガイド部11上に搬出する。これにより基板搬送時にガイド部の不連続部分が発生せず、基板5の搬入・搬出を確実に行うことができる。



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【特許請求の範囲】

【請求項1】処理対象の基板の真空処理を行う処理室を形成し上下に開閉可能な真空チャンバと、前記処理室内に配設され前記基板を載置するとともに基板の搬送を案内するための基板ガイド部を有する載置部と、前記載置部に搬入される基板を水平姿勢で保持するとともに載置部への基板の搬入動作時に基板をガイドする搬入ガイド部と、載置部からの基板の搬出動作時に基板をガイドするとともに搬出された基板を水平姿勢で保持する搬出ガイド部と、前記真空チャンバが開状態のときに前記搬入ガイド部および搬出ガイド部をそれぞれ載置部に対して接近させて連結するガイド移動手段と、前記搬入ガイド部上の基板を載置部上に移動させる基板搬入移動手段と、載置部上の基板を前記搬出ガイド部上に移動させる基板搬出移動手段とを備えたことを特徴とする真空処理装置。

【請求項2】上下に開閉可能な真空チャンバ内に形成され真空処理を行う処理室に処理対象の基板を搬入し処理室から搬出する真空処理装置における基板搬送方法であって、前記処理室に配設され前記基板が載置される載置部に基板を搬入する搬入動作は、前記載置部に搬入される基板を搬入ガイド部に水平姿勢で保持させて待機させる待機工程と、前記真空チャンバが開状態のときに前記搬入ガイド部を載置部に対して接近させこの載置部の基板ガイドと連結させる搬入ガイド連結工程と、搬入ガイド連結状態において搬入ガイド部上の基板を基板搬入移動手段によって載置部上に移動させる搬入移動工程とを含み、前記処理室内の載置部から基板を搬出する搬出動作は、前記真空チャンバが開状態のときに搬出ガイド部を載置部に対して接近させて前記基板ガイド部と連結させる搬出ガイド連結工程と、搬出ガイド連結状態において載置部上の基板を基板搬出移動手段によって搬出ガイド部上に移動させる搬出移動工程とを含むことを特徴とする真空処理装置における基板搬送方法。

【請求項3】前記搬入ガイド部と搬出ガイド部とを基板ガイド部に連結しているときに、搬入移動工程と搬出移動工程とを同時に行うことを特徴とする請求項2記載の真空処理装置における基板搬送方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、基板を対象としてプラズマ処理などの真空処理を行う真空処理装置及び真空処理装置における基板搬送方法に関するものである。

【0002】

【従来の技術】基板の表面処理を行う装置として、プラズマ処理装置が知られている。このプラズマ処理装置は、減圧雰囲気下の処理室内でプラズマを発生させて対象物である基板のプラズマ処理を行うものである。処理室内に基板を搬入する方法として、一般に平面状に設けられた搬送路上で基板を水平姿勢で搬送する方法が用いら

れている。この方法は基板の幅寸法に対応して側面ガイドが設けられた搬送路上に基板を載置し、基板の後端部を押送する方法などによって、基板の処理室への搬入および処理室からの搬出を行うものである。

【0003】

【発明が解決しようとする課題】ところで、処理室の内部は外部から遮断された密閉構造とする必要があるため、上記搬送路上に処理室の内外を遮断する側壁が下降する部分では、搬送路は処理室の側壁の厚さに相当する隙間分だけ途切れて不連続となる。したがって、この不連続部分を基板が通過する際には、基板は上下方向及び左右方向のいずれもガイドされない状態で移動する。このとき、搬送対象が薄型の基板などすりや擦れを生じやすい基板である場合には、この隙間部分で基板の先端部が不連続部に引っかかり、搬送ミスを起こしやすい。そしてこの搬送ミスにより基板の破損を生じたり、また位置ずれ状態のまま処理室内でのプラズマ処理が実行されて、異常放電を誘発するなどの不具合の原因となっている。

【0004】そこで本発明は、基板の搬送ミスを防止することができる真空処理装置及び真空処理装置における基板搬送方法を提供することを目的とする。

【0005】

【課題を解決するための手段】請求項1記載の真空処理装置は、処理対象の基板の真空処理を行う処理室を形成し上下に開閉可能な真空チャンバと、前記処理室内に配設され前記基板を載置するとともに基板の搬送を案内するための基板ガイド部を有する載置部と、前記載置部に搬入される基板を水平姿勢で保持するとともに載置部への基板の搬入動作時に基板をガイドする搬入ガイド部と、載置部からの基板の搬出動作時に基板をガイドするとともに搬出された基板を水平姿勢で保持する搬出ガイド部と、前記真空チャンバが開状態のときに前記搬入ガイド部および搬出ガイド部をそれぞれ載置部に対して接近させて連結するガイド移動手段と、前記搬入ガイド部上の基板を載置部上に移動させる基板搬入移動手段と、載置部上の基板を前記搬出ガイド部上に移動させる基板搬出移動手段とを備えた。

【0006】請求項2記載の真空処理装置における基板搬送方法は、上下に開閉可能な真空チャンバ内に形成され真空処理を行う処理室に処理対象の基板を搬入し処理室から搬出する真空処理装置における基板搬送方法であって、前記処理室に配設され前記基板が載置される載置部に基板を搬入する搬入動作は、前記載置部に搬入される基板を搬入ガイド部に水平姿勢で保持させて待機させる待機工程と、前記真空チャンバが開状態のときに前記搬入ガイド部を載置部に対して接近させこの載置部の基板ガイドと連結させる搬入ガイド連結工程と、搬入ガイド連結状態において搬入ガイド部上の基板を基板搬入移動手段によって載置部上に移動させる搬入移動工程とを

含み、前記処理室内の載置部から基板を搬出する搬出動作は、前記真空チャンバが開状態のときに搬出ガイド部を載置部に対して接近させて前記基板ガイド部と連結させる搬出ガイド連結工程と、搬出ガイド連結状態において載置部上の基板を基板搬出移動手段によって搬出ガイド部上に移動させる搬出移動工程とを含む。

【0007】請求項3記載の真空処理装置における基板搬送方法は、請求項2記載の真空処理装置における基板搬送方法であって、前記搬入ガイド部と搬出ガイド部とを基板ガイド部に連結しているときに、搬入移動工程と搬出移動工程とを同時に行う。

【0008】本発明によれば、処理室内への基板の搬入動作時に基板をガイドする搬入ガイド部と処理室からの基板の搬出動作時に基板をガイドする搬出ガイド部とを水平移動させるガイド移動手段を備え、真空チャンバが開状態のときに搬入ガイド部および搬出ガイド部をそれぞれ載置部に対して接近させて、載置部上における基板の搬送動作時に基板を案内する基板ガイド部と連結することにより、基板搬送時にガイド部の不連続部分が発生せず、処理室への基板の搬入・搬出を確実に行うことができる。

【0009】

【発明の実施の形態】次に本発明の実施の形態を図面を参照して説明する。図1は本発明の一実施の形態の真空処理装置の斜視図、図2は本発明の一実施の形態の真空処理装置の載置部の斜視図、図3、図4は本発明の一実施の形態の真空処理装置の部分斜視図、図5、図6は本発明の一実施の形態の真空処理装置における基板搬送方法の動作説明図である。

【0010】まず、図1を参照して真空処理装置の全体構造を説明する。図1において、真空処理装置は、基板供給部1、真空処理部2および基板回収部3より構成される。真空処理部2は、ベース部6と蓋部材9より構成され蓋部材9が昇降することにより上下に開閉可能な真空チャンバ2aを備えており、蓋部材9がベース部6の上面に当接した状態で、真空チャンバ2aは処理対象の基板の真空処理を行うための密閉された処理室9aを形成する(図5(a)参照)。

【0011】図2に示すように、ベース部6上の上記処理室9a内には、電極部7がベース部6の上面から上方に突出して設けられており、電極部7の上面は処理対象の基板5を載置する載置部7aとなっている。載置部7aは基板5を載置するとともに基板5の搬送を案内するための基板ガイド部8を有している。基板ガイド部8の上面には、基板搬送時に基板5の側面をガイドする3条のガイドレール8a、8b、8cが設けられており、2枚の基板5を同時に載置・搬送できるようになっている。

【0012】蓋部材9が下降してその側壁部が当接するベース部6の上面にはシール部材6cが装着されてお

り、当接時に蓋部材9とベース部6上面とを密閉する。またベース部6の上面には、ガス供給孔6a、真空排気・大気導入孔6bが設けられている。

【0013】図1において基板供給部1は、真空処理対象の基板5を段積み状態で多数収納するマガジン4を備えており、マガジン4と真空処理部2の間には搬入ガイド部10が配設されている。搬入ガイド部10は、マガジン4から押し出され載置部7aに搬入される基板5を水平姿勢で保持するとともに、載置部7aへの基板5の搬入動作時に基板5をガイドする。搬入ガイド部10上の基板5は、さらに電極部7上の基板ガイド部8へ乗り移り、載置部7aへ搬入される。この基板搬入動作時の基板5の移動は、搬入アーム13によって基板5を押送することによって行われる。

【0014】基板回収部3は、基板供給部1と同様のマガジン4を備えており、真空処理部2と基板回収部3との間には、搬出ガイド部11が配設されている。搬出ガイド部11は、載置部7aからの基板5の搬出動作時に基板5をガイドするとともに搬出された基板5を水平姿勢で保持する。真空処理部2において真空処理された基板5は、基板ガイド部8から搬出ガイド部11上へ乗り移り、さらに搬出ガイド部11上からマガジン4内に押し込まれて回収される。この基板搬出動作時の基板5の移動は、搬送アーム14によって基板5を押送することによって行われる。

【0015】次に図3、図4を参照して、基板5を電極部7上の載置部7aへ搬入し、搬出する基板搬送機構の詳細について説明する。図3において、搬入ガイド部10、搬出ガイド部11は、それぞれアーム部材16、17によって保持されている。アーム部材16、17は、それぞれシリンダ15、18のロッド15a、18aに結合されており、搬入ガイド部10、搬出ガイド部11はそれぞれシリンダ15、18によってX方向に水平往復動可能となっている。

【0016】また搬入ガイド部10、搬出ガイド部11は、それぞれ基板ガイド部8のガイドレール8a、8b、8cと同様の配列の、ガイドレール10a、10b、10cおよびガイドレール11a、11b、11cを備えている。ここで搬入ガイド部10、搬出ガイド部11の基板ガイド部8に対する相対位置は、Y方向についてはガイドレール10a、10b、10cおよびガイドレール11a、11b、11cが、それぞれ対応するガイドレール8a、8b、8cと同一直線上に位置するように、またZ方向については、搬入ガイド部10、搬出ガイド部11の搬送面が基板ガイド部8の搬送面と同一高さとなるように配置されている。

【0017】したがって、図4に示すようにシリンダ15を駆動して、搬入ガイド部10の下流側の端部10eが載置部7aに接近するように、すなわち、端部10eが基板ガイド部8の上流側の端部8dに接近するように

搬入ガイド部10を水平移動させることにより、搬入ガイド部10は基板ガイド部8と連結する。

【0018】また同様に、シリンダ18を駆動して、搬出ガイド部11の上流側の端部11dが載置部7aに接近するように、すなわち、端部11dが基板ガイド部8の下流側の端部8eに接近するように搬出ガイド部11を水平移動させることにより、搬出ガイド部11は基板ガイド部8と連結する。シリンダ15、18は、真空チャンバ2aが開状態のときに搬入ガイド部10および搬出ガイド部11をそれぞれ載置部7aに対して接近させて連結するガイド移動手段となっている。

【0019】この連結は、搬入ガイド部10の一方側（下流側）と載置部7aとを連結し、同時に搬出ガイド部11の他方側（上流側）と載置部7aとを連結する形態となっている。なお、上記実施の形態においては、図3に示すように搬入ガイド部10の下流側の端部10eが基板ガイド部8の上流側の端部8dに、また搬出ガイド部11の上流側の端部11dが基板ガイド部8の下流側の端部8eに、それぞれほとんど当接する位置まで接近させる例を示しているが、接近状態において、基板5の乗り移りに差し障りがない範囲で各連結面に隙間を設けるようにしてもよい。

【0020】そしてこの連結状態において、搬入ガイド部10から載置部7aへの基板5の搬入、および載置部7aから搬出ガイド部11への基板5の搬出が行われる。X方向に配設された移動テーブル12には、搬入アーム13、搬出アーム14が設けられており、搬入アーム13は搬入ガイド部10と基板ガイド部8を移動範囲として、また搬出アーム14は基板ガイド部8と搬出ガイド部11を移動範囲として、それぞれX方向に移動する。また搬入アーム13、搬出アーム14は図示しない上下動機構により上下動可能となっている。

【0021】搬入アーム13、搬出アーム14は、それぞれ搬送爪13a、14aを備えており、搬送爪13a、14aを基板5の後端部に当接させた状態で移動テーブル12を駆動することにより、搬入アーム13、搬出アーム14はそれぞれ搬入ガイド部10から基板ガイド部8へ、また基板ガイド部8から搬出ガイド部11へ基板5を移動させる。したがって移動テーブル12と搬入アーム13は、搬入ガイド部10上の基板5を載置部7a上に移動させる基板搬入移動手段となっており、また移動テーブル12と搬出アーム14は、載置部7a上の基板5を搬出ガイド部11上に移動させる基板搬出移動手段となっている。

【0022】この真空処理装置の基板搬送機構は上記のような構成となっており、以下真空処理装置における基板搬送動作について、図5、図6を参照して説明する。図5、図6は、1つの基板5を対象として処理室9a内での真空処理が完了した後、この基板5を搬出して新たな基板5を処理室9a内の載置部7aに搬入するまでの

一連の動作を示している。

【0023】図5(a)において、真空チャンバ2aの蓋部材9はベース部6上に下降した状態にあり、この状態で形成される処理室9a内では、電極部7上の基板ガイド部8に載置された基板5を対象とした真空処理が行われている。このとき、搬入ガイド部10では既に次の基板5が水平姿勢で保持されて待機状態にあり、搬出ガイド部11は空状態となっている。そして、搬入アーム13の搬送爪13a、搬出アーム14の搬送爪14aは、それぞれ待機位置にある。

【0024】処理室9a内での真空処理が完了すると、図5(b)に示すように、蓋部材9が上昇して真空チャンバ2aが開状態となる。そしてこの後搬送爪14aが基板ガイド部8の上流側まで移動する。次いで図5(c)に示すように、搬入ガイド部10および搬出ガイド部11をそれぞれ基板ガイド部8に対して接近させ連結する。

【0025】そしてこの状態で、搬送爪13a、14aを下降させ、搬入ガイド部10上の基板5、基板ガイド部8上の基板5のそれぞれの後端部に位置させる。次いで図5(d)に示すように搬送爪13a、14aを下流側へ移動させることにより、真空処理後の基板5は載置部7aから搬出ガイド部11上へ搬出されるとともに、新たな基板5が搬入ガイド部10上から載置部7aへ搬入される。この基板搬送動作時において、ベース部6上のシール部材6cは上方を搬入ガイド部10および搬出ガイド部11によって覆われた状態となることから、シール部材6cを異物の接触などによる損耗から保護することができる。

【0026】この後、図6(a)に示すように、搬送爪13a、14aを上昇させ、次いで図6(b)に示すように、搬入ガイド部10、搬出ガイド部11を載置部7aから離隔させるとともに、搬送爪13a、14aをそれぞれの待機位置まで退去させる。これにより、新たな真空処理の1サイクルが開始可能な状態となる。

【0027】この後図6(c)に示すように、蓋部材9をベース部6上に下降させて形成された処理室9a内では、新たな基板5を対象として真空処理が行われるとともに、搬入ガイド部10には次の基板5がマガジン4から押し出されて供給され、搬入ガイド部10にて待機状態となる。また搬出ガイド部11に搬出された処理済みの基板5は、搬送爪14aによって下流側のマガジン4内に押し込まれて回収される。

【0028】上記説明したように、上記基板搬送方法において、処理室9aの載置部7aに基板5を搬入する搬入動作は、載置部7aに搬入される基板5を搬入ガイド部10に水平姿勢で保持させて待機させる待機工程と、真空チャンバ2aが開状態のときに搬入ガイド部10を載置部7aに対して接近させこの載置部7aの基板ガイド部8と連結させる搬入ガイド連結工程と、搬入ガイド

連結状態において搬入ガイド部10上の基板5を搬入アーム13によって載置部7a上に移動させる搬入移動工程とを含んだものとなっている。

【0029】また載置部7aから処理済みの基板5を搬出する搬出動作は、真空チャンバ2aが開状態のときに搬出ガイド部11を載置部7aに対して接近させて基板ガイド部8と連結させる搬出ガイド連結工程と、搬出ガイド連結状態において載置部7a上の基板5を搬出アーム14によって搬出ガイド部11上に移動させる搬出移動工程とを含むものとなっている。そして上記基板搬送動作においては、搬入ガイド部10と搬出ガイド部11とを基板ガイド部8に連結しているときに、搬入移動工程と搬出移動工程とを同時に行う形態となっている。

【0030】このような基板搬送方法を採用することにより、基板搬送時に基板を案内するガイド部の不連続部分が発生せず、薄型基板のような反りや撓みを生じやすく搬送ミスが発生しやすい基板を対象とする場合にあって、処理室への基板の搬入・搬出を確実に行うことができる。

【0031】

【発明の効果】本発明によれば、処理室内への基板の搬入動作時に基板をガイドする搬入ガイド部と処理室からの基板の搬出動作時に基板をガイドする搬出ガイド部とを水平移動させるガイド移動手段を備え、真空チャンバが開状態のときに搬入ガイド部および搬出ガイド部をそれぞれ載置部に対して接近させて、載置部上における基板の搬送動作時に基板を案内する基板ガイド部と連結するようにしたので、基板搬送時にガイド部の不連続部分が発生せず、薄型基板を対象とする場合にあって処理

室への基板の搬入・搬出を確実に行うことができる。

【図面の簡単な説明】

【図1】本発明の一実施の形態の真空処理装置の斜視図

【図2】本発明の一実施の形態の真空処理装置の載置部の斜視図

【図3】本発明の一実施の形態の真空処理装置の部分斜視図

【図4】本発明の一実施の形態の真空処理装置の部分斜視図

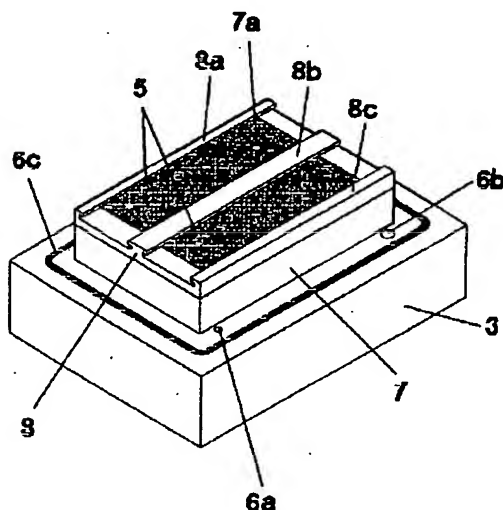
【図5】本発明の一実施の形態の真空処理装置における基板搬送方法の動作説明図

【図6】本発明の一実施の形態の真空処理装置における基板搬送方法の動作説明図

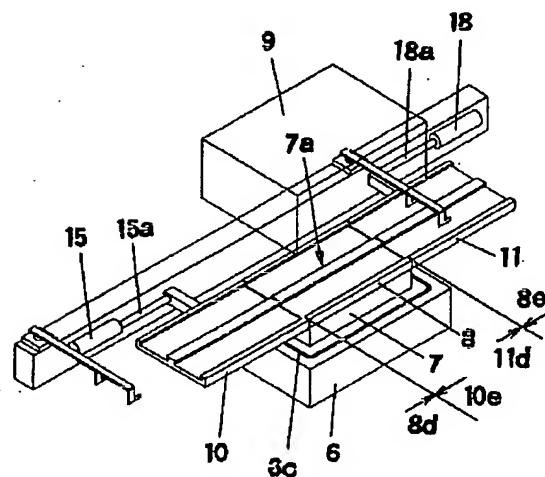
【符号の説明】

- 1 基板供給部
- 2 真空処理部
- 2a 真空チャンバ
- 3 基板回収部
- 5 基板
- 7 電極部
- 7a 載置部
- 8 基板ガイド部
- 10 搬入ガイド部
- 11 搬出ガイド部
- 12 移動テーブル
- 13 搬入アーム
- 14 搬出アーム
- 15, 18 シリンダ

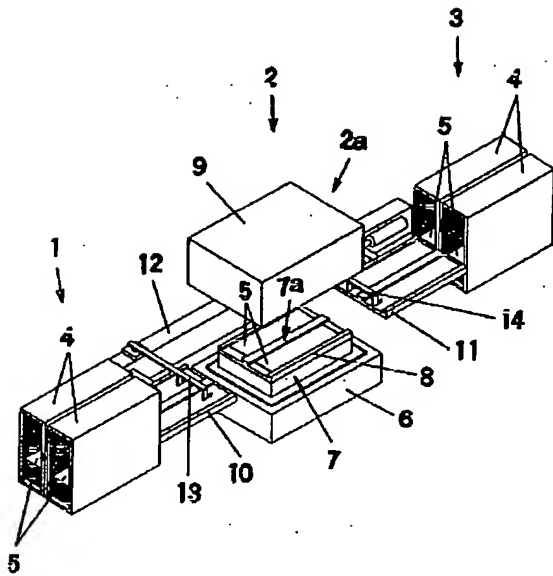
【図2】



【図4】

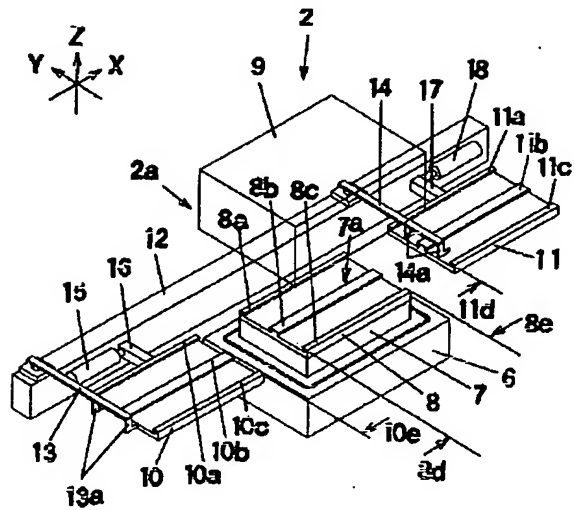


【図1】



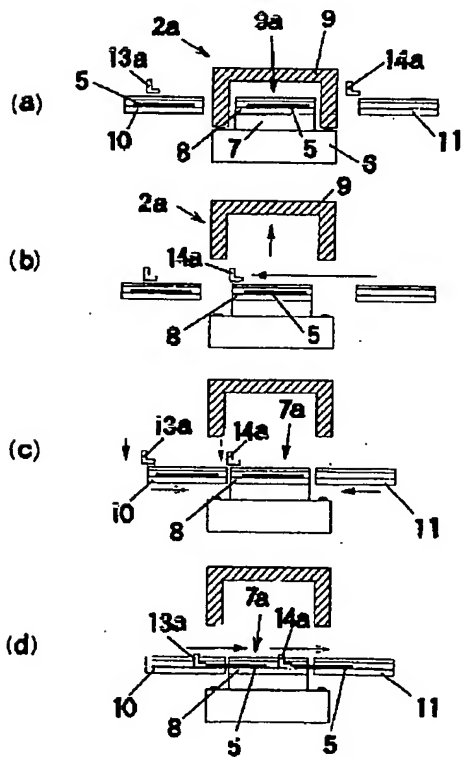
- | | | |
|-----------|-----------|-----------|
| 1 基板供給部 | 7 電極部 | 12 移動テーブル |
| 2 真空処理部 | 7a 電極部 | 13 搬入アーム |
| 2a 真空チャンバ | 8 基板ガイド部 | 14 搬出アーム |
| 3 基板回収部 | 10 搬入ガイド部 | |
| 5 基板 | 11 搬出ガイド部 | |

【図3】

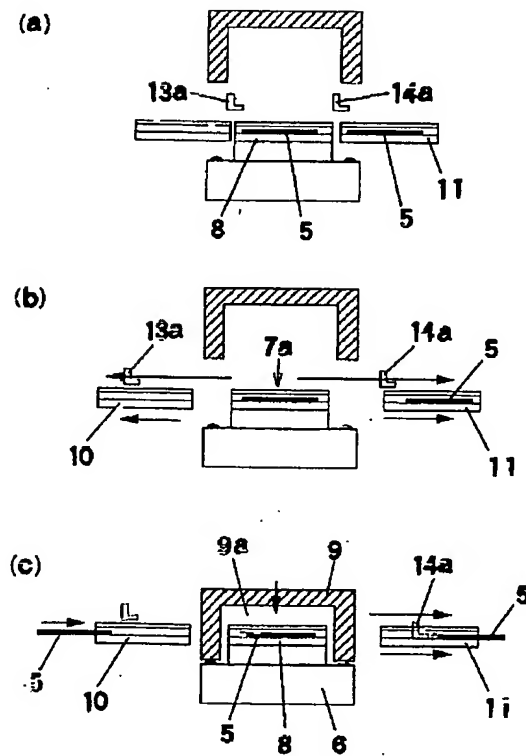


15, 18 シリンダ

【図5】



【図6】



フロントページの続き

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